# REPORT ON VELOCITY TRANSDUCER FAILURES
# INTERMOUNTAIN POWER, DELTA UTAH
# COOLING TOWER FAN MONITORING SYSTEMS

PREPARED BY

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for

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DELTA, UTAH

INTRODUCTION

This is a report summarizing tests done on cooling tower fan monitoring system velocity transducers at Intermountain Power, Delta, Utah.

This investigation was first prompted by the return of seismoprobe serial number J304982 from Intermountain Power to Phil Hanifan, Bently Nevada Product Engineering Manager. Four more units, S/N J304978, J304969, J304964, and J304958 had previously been returned to Bently Nevada Product Service.

The monitoring instrumentation installed is Bently Nevada 9000 Series Low Frequency Vibration Monitors and Bently Nevada 270 CPM Horizontal Velocity Seismoprobes, part number 16699-03.

Chuck Rodriguez, Bently Nevada Field Service Representative delivered 11 new transducers 17 December 1987. He also oversaw the recording of data from several fans. At this time several transducers were removed from the installation and returned for engineering evaluation at Bently Nevada.

UNIT BY UNIT EVALUATION

The problem indicated by Intermountain Power with the transducers is they are not providing an accurate or consistent indication of machine vibration from transducer to transducer. The specification allows for ±3db tolerance in output which could create a possible 2 X variation from unit to unit at low frequency.

In evaluating the transducers returned, it was found that the signal path in S/N '958 and '982 was shorted to the case. If a shorted transducer and its monitor are not earth grounded, the OK LED will remain illuminated and any extraneous noise present on the machine case will be coupled to the transducer signal and amplified at the monitor. In the lab at Bently Nevada a signal from a noise source was attached to the case of S/N '982. Photo #1 shows the output, both velocity and integrated velocity, of S/N '982 through a low frequency vibration monitor's buffered A and B output. This simulates any installation of a shorted coil transducer on an ungrounded machine which has some noise present. In the same conditions as photo #1, the velocity and integrated velocity output of an earth grounded transducer whose coil is not shorted would have zero output.

The other failure mode discovered in 2 units, S/N '968 and '969,

is due to the transducers internal moving mass contacting the stationary components inside. This is termed "drag". Because drag is orientation sensitive, a "good" unit in one installed angular orientation may be "bad" in other orientations. Photo 2 is S/N '968 comparing a proximity displacement transducer signal to the integrated velocity signal from a velocity transducer having drag. At 0.8 Hz the amplitude of the integrated velocity is 75.9 mV while the actual displacement amplitude is less than 10 mV. Photo 3 is of the same conditions but with the seismoprobe rotated by unscrewing it from its mounting (counterclockwise) 15°. Photo 4 is rotated (counterclockwise) 30° from photo 2. In photos 2 and 3 the transducer is in its drag orientation, photo 3 approaching the non drag condition of photo 4. It can be seen that installed orientation affects the degree of drag and contributes to variations in indicated machine vibration.

Similar failures could not be repeated in the lab on the remaining 2 units, S/N '964 and '978 returned by Intermountain Power. These 2 appear to be functioning correctly. This does not mean they were functioning correctly while installed at Intermountain Power. If internal component shifting due to handling, during shipping, for instance, could cause drag, the same handling may correct it.

All transducers delivered by Chuck Rodriguez on 17 December 1987 were double checked for drag, coil shorting, and frequency response to 25 Hz. Serial number J306738 from this group was returned to Bently Nevada, retested and found to have drag. It is possible due to handling that some internal components could have shifted and made contact with the coil. Two other units brought back by Chuck, S/N ~~J306738~~ and ~~J304969~~ (September shipment) also have drag. Photos 5 and 6 show drag in unit '969. Because of severe drag, the moving element is almost completely locked. A very small velocity signal is seen in photo 5 and the displacement represented in photo 6 is a result of this small velocity signal being integrated and amplified by a low frequency vibration monitor.

Also transducer S/N J306743 from the group delivered by Chuck was returned. This unit's base was damaged during removal and is difficult to tell if its condition was affected during removal. However it was further disassembled, cleaned, reassembled and tested and found to perform well.

Serial Number J304975 (September shipment) was returned and was also found to perform well.

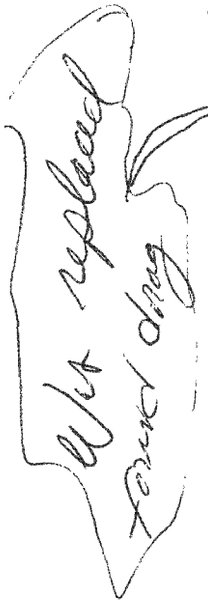
CORRECTIVE ACTION

A test has been implemented in which all transducers are continuously tested for drag while rotating them on their axis. This should guarantee units shipped are free from drag. Also in place is a 200 VAC Hi Pot test to guarantee coil/case isolation.

PLAN

To begin to solve the problem with the rest of the installed transducers at Intermountain Power, the 9 units remaining from those delivered by Chuck Rodriguez will be installed and carefully evaluated. If these perform satisfactorily, all transducers currently installed will be replaced. All of these replacements will be checked and double checked for drag and will be ready to install no later than 25 January 1988. Chuck Rodriguez will deliver the transducers and be available to help with installation.

The data from the tape recorded at Intermountain Power on 18 December 1987 indicates what appears to be transducers with drag on fans 1A11, 1B03, and 1B04. These 3 should be changed out as soon as possible and evaluated with a spectrum analyzer at a frequency span of 0 to 25 Hz to verify that this is corrected.




This plan will correct these known problems. Once this has been implemented, a fan by fan evaluation will be conducted to assure that no further problems exist.

Please feel free to call me directly at Bently Nevada Corp. if you have any questions regarding this report.

John Warner
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Bently Nevada Corporation
Phone: 702-782-3611 ext. 9508

COPY: Phil Hanifan
Roger Heath
Chuck Rodriguez
Mala Chizek

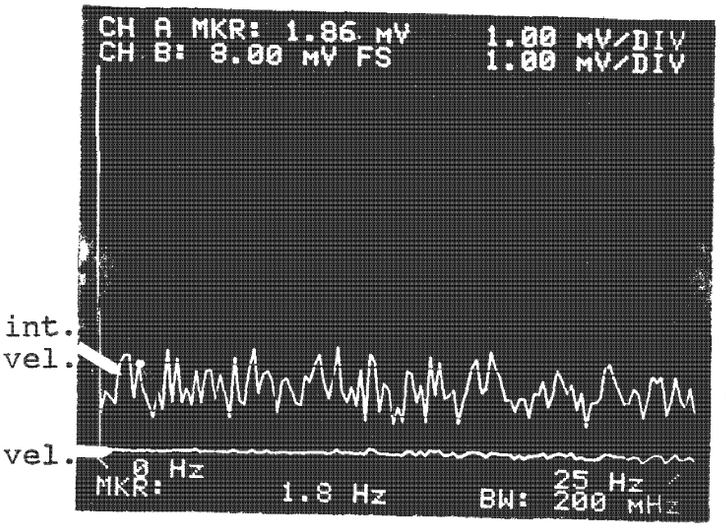


PHOTO #1 S/N J304982

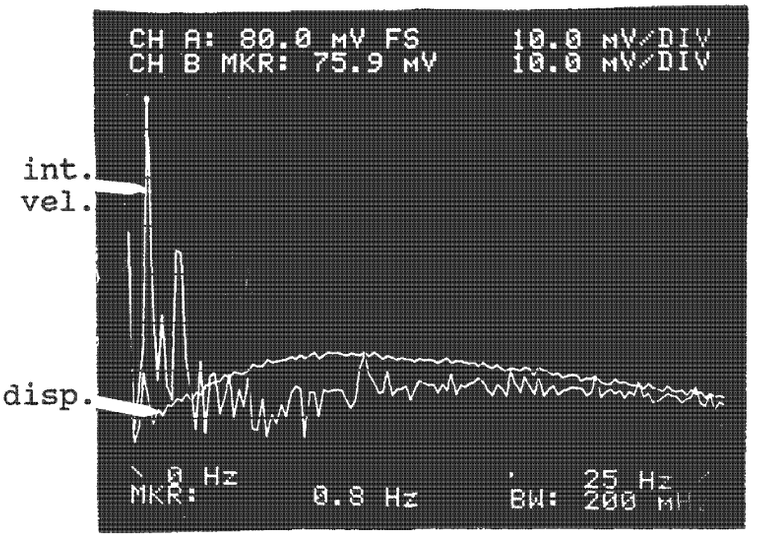


PHOTO #2 S/N J304968

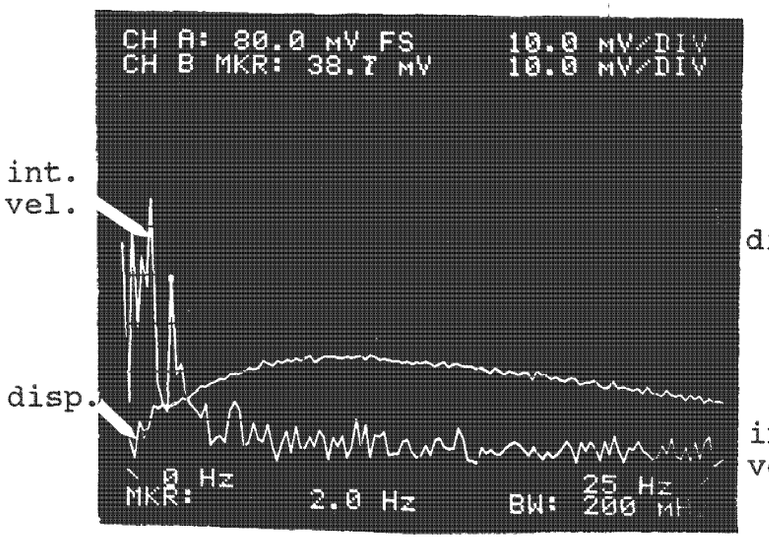


PHOTO #3 S/N J304968

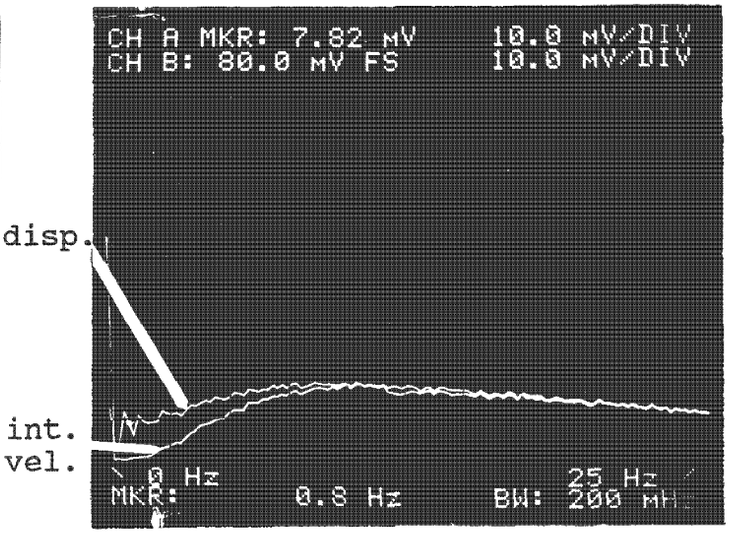


PHOTO #4 S/N J304968

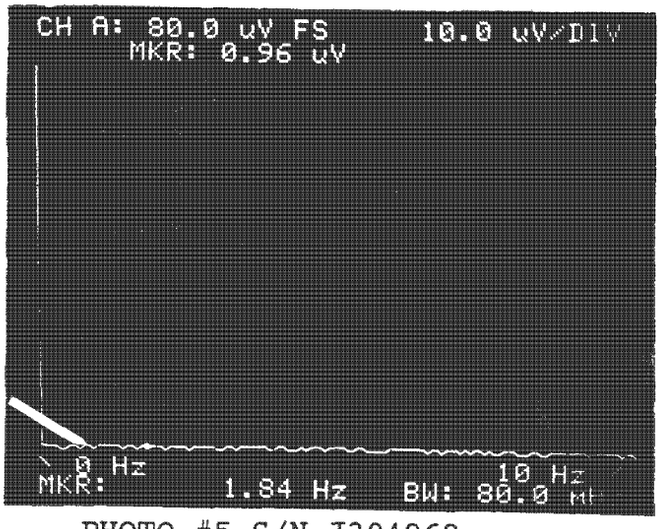


PHOTO #5 S/N J304969
(displacement omitted)

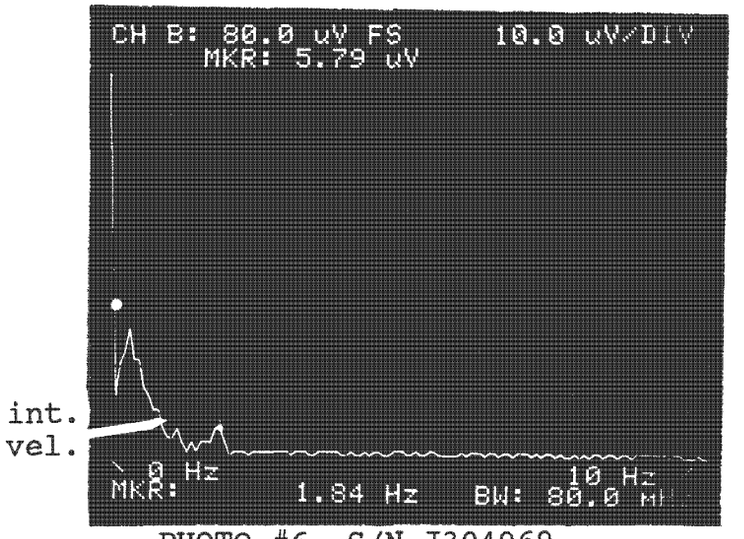


PHOTO #6 S/N J304969
(displacement omitted)